Using 3D X-Ray tomography images to build pore network model for permeability prediction

D. Bernard[1] and N. Combaret[1,2]

1 CNRS, Univ. of Bordeaux, ICMCB, 87 av. du Dr. A. Schweitzer, Pessac F-33608 France
2 VSG, Visualization Sciences Group, SAS, 87, Avenue Kennedy, Merignac F-33708 France

The vision of micro scale transport in porous media as the result of numerous simple interactions between simple elements, i.e. the pores, gives rise to various pore network model (PNM) approaches and to a large number of new results concerning pore scale physics.
With the development of high-resolution 3D imaging, building PNM representing precisely the micro geometry seems to be straightforward. As illustrated by this presentation, it is not yet the case.

Dominique Bernard, is a CNRS senior researcher. He received his degree in mechanical engineering in 1979 (ENSAM Paris), and his PhD in 1981 (Bordeaux). After a post-doc in Venezuela (1982-1984) in the R&D Institute for the Venezuelan oil industry, he jointed the CNRS in 1985. At ICMCB, D. Bernard is leading a team using X-ray computed micro tomography (XCMT) to characterise 3D microstructure of multi materials, to understand and quantify their modifications in time and to perform realistic numerical simulations of the coupled phenomenon occurring during those modifications. Their expertise covers a domain going from data acquisition (using synchrotron or micro focus laboratory micro tomograph), data treatment (artefacts correction, filtering, 3D reconstruction, 3D registration) and data analysis (3D visualisation, 3D image analysis) to numerical modelling and numerical models development (change of scale methods, effective properties calculation, direct numerical modelling at the pore scale). Through a large number of industrial and academic projects, a great variety of materials have been studied: polymer foams under dynamic loading, aluminium alloys during solidification, ceramics during sintering, concrete during leaching, carbonate rocks during reactive percolation.